

IN THE SPECIFICATION:

Please replace paragraph number [0001] with the following rewritten paragraph:

[0001] This application is a continuation of application Serial No. 10/046,132, filed January 9, 2002, ~~pending~~ now U.S. Patent No. 6,691,505, issued February 17, 2004, which claims the benefit of priority of U.S. provisional application Serial No. 60/260,704 filed January 10, 2001, the complete disclosure of which is incorporated herein by reference.

Please replace paragraph number [0002] with the following rewritten paragraph:

[0002] Field of the Invention: This invention relates to insulation materials and methods, for example, for internal and external insulating applications in rocket ~~motors~~, motors and, more particularly, to insulation having carbon fibrous components. The novel insulation of this invention is especially useful for insulating the interior surface of the casing of a solid propellant rocket motor, among other applications.

Please replace paragraph number [0008] with the following rewritten paragraph:

[0008] Rubbers or elastomers have also been used as rocket motor insulation materials in a large number of rocket motors. Cured ethylene-propylene-diene monomer ("EPDM") terpolymer is a specifically advantageous rubber used alone or ~~in-blend~~, blend and is often selected because of its favorable mechanical, thermal, and ablative properties. However, in high velocity environments, the ablative properties of elastomers are sometimes inadequate for rocket motor operation unless the elastomers are reinforced with suitable fillers. The criticality of avoiding high erosion rates is demonstrated by the severity and magnitude of risk of failure due to erosion. Most insulation is, of necessity, "man-rated" in the sense that a catastrophic failure can result in the loss of human life. The monetary cost of failure in satellite launches is well publicized. Additionally, the tensile strength and tear strength of unfilled elastomers may not be sufficiently high to withstand and endure the mechanical stresses that the elastomer is subjected to during processing.

Please replace paragraph number [0010] with the following rewritten paragraph:

[0010] Current silica-filled elastomeric insulation materials are electrically insulating, exhibiting high volume-resistivities, resistivities and, hence, a poor ability to dissipate static charge. The ability to dissipate static charge is considered to be an important quality for the thermal insulator. An insulator possessing this quality is able to bleed off or dissipate charges that build up on the insulator surface. An insulator having a high electrical resistivity does not dissipate static charge timely, thus creating a potential for static charge to build up to a dangerous level. When the electric field increases to the point that breakdown of the air occurs or a path to ground for the static charge is inadvertently provided, the discharge can be dangerous. Physical harm to personnel and flash fires are possible. Conventional silica-filled EPDM insulation is electrically insulating, having resistivities ranging from 1×10^{14} to 1×10^{16} Ohm·cm. An insulator is considered to be able to dissipate static charge if its volume resistivity is in the range of from 1×10^5 to 1×10^{12} Ohm·cm. Asbestos-filled NBR, which is one of the few currently used insulation materials that is considered to be able to dissipate static charge, has a volume resistivity in the range of 1×10^{11} to 1×10^{12} Ohm·cm. However, the use of asbestos in rocket motors has lost favor due to reported health dangers associated with asbestos.

Please replace paragraph number [0016] with the following rewritten paragraph:

[0016] A rocket motor is also provided which comprises a rocket motor casing comprising a combustion chamber, a propellant contained in the casing and formulated to generate combustion products upon ignition, and a nozzle assembly. The nozzle assembly has a restrictive throat and an exit-region, region and is operatively engaged with the rocket motor case to receive the combustion products and to pass the combustion products through the throat before discharging the combustion products from the exit region. Insulation is arranged internally in or externally on the rocket motor casing and/or the nozzle assembly for insulating or heat shielding. The insulation comprises a cured elastomer and vapor-grown carbon fibers dispersed in the cured elastomer. The cured elastomer is preferably formed from a precursor composition comprising an EPDM terpolymer.

Please replace paragraph number [0025] with the following rewritten paragraph:

[0025] It is to be noted that, as used in the specification and the appended claims, the singular forms “a,” “an,” and “the” include plural referents unless the context clearly dictates otherwise. Thus, by way of example, the term “a crosslinkable polymer” includes in its definition not only a single crosslinkable ~~polymer~~, polymer but also a combination of two or more polymers, for example. Also, the term “polymer” encompasses homopolymers, copolymers, and terpolymers. “Terpolymer” means a polymer made from three or more monomers.

Please replace paragraph number [0027] with the following rewritten paragraph:

[0027] In accordance with one embodiment of the invention, there is shown in FIG. 1B an embodiment of the insulation 10 of this invention applied to the interior surface of a rocket motor casing 12. The solid propellant 16 illustrated in FIG. 1A is a center perforation propellant, although the invention is not thereby limited, since the insulation may be used with end-burning propellants and other propellant configurations. Typically, a liner 14 is interposed between the insulation 10 and the solid propellant 16, although the liner 14 may directly bond the propellant 16 to the casing 12. The insulation 10 and liner 14 serve to protect the casing 12 from the extreme conditions produced as the propellant 16 is burned. Methods for loading a rocket motor casing 12 with insulation 10, a liner 14, and propellant 16 are known to those skilled in the art, art and can be readily adapted with ordinary skill of the art to find use with the insulation of this invention. Nozzle 20 is operatively associated with the casing 12 to receive combustion products generated by combustion of the propellant 16 and to expel the combustion products, thus generating thrust to propel the rocket.

Please replace paragraph number [0040] with the following rewritten paragraph:

[0040] A sulfur-containing gaseous compound can also be present in the reactor during catalytic growth of the carbon fiber. Hydrogen sulfide may enhance fiber growth from the iron ~~catalyst~~, catalyst and will remain in the fiber.

Please replace paragraph number [0058] with the following rewritten paragraph:

[0058] Ablative tests were performed in a char motor, such as the one illustrated in FIG. 2. Char motors are constructed to evaluate the ablative properties of solid rocket motor case insulating materials. A char motor includes a propellant beaker 21 to provide the combustion gases, evaluation chambers to hold the test materials, and a constricting nozzle to produce the required pressure. The char motors were fired with RSRM TP-H1148 (polybutadieneacrylic acid acrylonitrile (PBAN)) propellant. The evaluation chamber is divided into three sections. The first one is a "low velocity" cylindrical region 22 about eight inches long and eight inches in diameter (approximately the same diameter as the propellant beaker). A short conical transition chamber 24 slightly constricts the gas flow pathway from 4 inches to 3.97 inches in ~~radius~~, radius and vents the propellant gases into a 22 inch long conical test chamber. The test chamber is divided into the "middle velocity" region 26 and the "high velocity" region 28. The test chamber tapers over regions 26 and 28 to constrict the diameter of the gas flow pathway from 3.97 inches to 1.56 inches in radius. The measurement points extend from the axial locations 0.5 to 3.5 inches, 5.6 to 15.23 inches, and 16.6 to 26.3 inches for the three velocity sections.